SECTION 8.0

TRANSPORT

8.1 Introduction

In the Transport Cost Proxy Model (TCPM) module, BCPM 3.1 uses information on existing interoffice traffic routing relationships between remote/host/ tandem switches to develop forward looking transport costs using SONET technology.

TCPM deploys sophisticated optimization algorithms to determine the most efficient ring configuration for a given study area. These optimization algorithms utilize actual data on remote-host-tandem switch homing[44] relationships, V&H coordinates, number of working lines, and access line to trunk ratios (used to derive traffic characteristics). The TCPM module is an extremely flexible Excel spreadsheet model, permitting cost analysis for an area as small as a single exchange or as large as an entire company. The user also has the ability to alter all of the primary transport cost inputs.

The Model develops a cost per line for the entire SONET ring. This cost can then be assigned to individual switches on the ring based on their unique characteristics.

8.2 BCPM 3.1 Enhancements

In its earliest versions, BCPM included only a simple transport multiplier in its analysis of costs to be attributed to supported services. BCPM 3.1 methodology has taken a dramatic step forward by creating a realistic model of the interoffice network based on the actual homing relationships between remotes and hosts, and hosts and tandems. It then develops specific and accurate cost elements based on trunking configurations of specific nodes[45] on the network.

TCPM in BCPM 3.1 has a number of important features. The module:

[44] Homing relationships summarize current trunking designs between switches for interoffice traffic.

[45] A node is the location of a SONET electronic device on a ring in a central office.

1. Utilizes efficient SONET bandwidth (OC3, OC12, OC48), given the specified host and remote locations, number of access lines, and trunks;
2. Uses only SONET technology that is currently available in the market;
3. Provides one level of redundancy via what is commonly referred to as self-healing rings;[46]
4. Provides a second level of redundancy by using two sets of lines for offices served by a folded ring;[47]
5. Includes a third level of redundancy by providing one extra DS1 for every seven working DS1s on the port side in a central office;
6. Determines the number of rings to be built and the sequences of nodes on the ring;
7. Allows the user to run the Model for a single ring, thereby enabling the user to trace the cost calculations through the logic of the Model;
8. Maps the nodes subtending a particular host or tandem; and
9. Provides the following reports for each ring: a) transport cost results for all of the rings; b) transport configuration of all of the rings; and c) universal service transport cost on a per line basis.

8.3 SONET Overview

Synchronous optical network (SONET) is a set of standards for optical (fiber optic) transmission. It was developed to meet the need for transmission speeds above the T3 level (45 Mbps) and is generally considered the standard choice for transmission devices used with broadband networks. Technologies like T3 are likely to be replaced by new services offered through a SONET platform. By way of comparison, OC-1 can carry over 30 times more data than DS1.

SONET enables more efficient use of installed fiber; it taps the latent capacity already in the network. SONET allows new network configurations, including ring networks, which have a greater degree of survivability than traditional mesh networks.

[46] If the fiber cable in a "self healing" ring is cut the signals will automatically reverse their direction on the ring.

[47] A folded ring connects an office to a single node on the SONET ring.

8.4 Transport Model Methodology

8.4.1. Model Inputs

To run the Model, three sets of inputs are required. The first includes Local Exchange Routing Guide (LERG) data that specifically identifies and locates the in place switching network. That information includes:

A. Operating Company Number;
B. Local Name of the switch;
C. Eleven digit CLLI code of the switch;
D. V&H coordinates of the switch;
E. CLLI code of the tandem serving the switch;
F. CLLI code of the host for remote offices; and
G. V&H coordinates of the host (if a remote office) or tandem.

The records are sorted to list each host office followed by all of its remote offices, and each tandem followed by each of its subtending offices. (Note: a host office with remotes appears on this list twice, once with its remotes and once with its associated tandem).

The second set of inputs includes those required to set thresholds in the Model. The user may provide these specifications or use the provided default values. The variables include:

1. Maximum number of nodes per ring;
2. Airline miles to route miles factor;
3. Line to trunk factor;
4. Tandem trunk factor;
5. Ratio of Special access lines to switched lines;
6. Size of SONET systems available and the maximum fill factor for each;
7. Number of minutes of traffic per DS1 (assumed);
8. Whether or not route diversity is assumed in the case of a folded (two point) ring;
9. Maximum distance between rings allowed without requiring repeaters;
10. EAS/Exchange percentage of minutes of use;
11. Material Costs;
12. Engineering/Installation Labor costs; and

13. Utilization Factors.

The final set of inputs is the number of access lines served by the switch as determined by the loop module.

8.4.2 Running the Model

8.4.2.1 Building the Rings

The Model begins by creating a forward-looking ring connecting all remotes to their hosts and hosts to their tandems. It assumes that all remote offices are connected to their respective host offices by SONET rings. If there is only one remote, a folded ring is assumed. All host offices are connected to their tandems by SONET rings. A ring with only three nodes is already considered optimized.

The Model designs the rings using a sorting process based on distances between remotes and hosts and sizing the rings based on preset input variables. The algorithm for this process is the following:

A. If there are less than four nodes, including the host, stop. (A ring with only three nodes is by definition optimized.) Move to sizing the ring.
B. Sort the remaining nodes in order of distance from the host.
C. Find the two non-collocated nodes that are nearest to the host.
D. Define a 3 segment ring connecting the host and these two points, (in the attached diagram the host is point A, the other two points are B and C).
E. Find the next nearest node to the host (labeled D in the diagram).
F. Determine the distance from the new point to each current point on the ring (AD, BD and CD).
G. For each segment on the ring, calculate the sum of the distances from the new point to each of the endpoints of that segment, less the length of the segment.
    1. AD + BD - AB
    2. AD + CD - AC
    3. BD + CD - BC
H. Choose the segment with the shortest net distance in step G. In our example, this would be number 2 - segment AC.

I. Replace this segment with two new segments connecting the new node to the end points (so that the ring now goes from A to B to C to D and back to A).

Diagram 1 - Step E

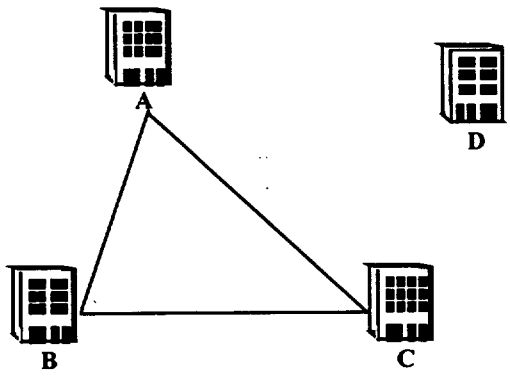


Diagram 2 - Step F

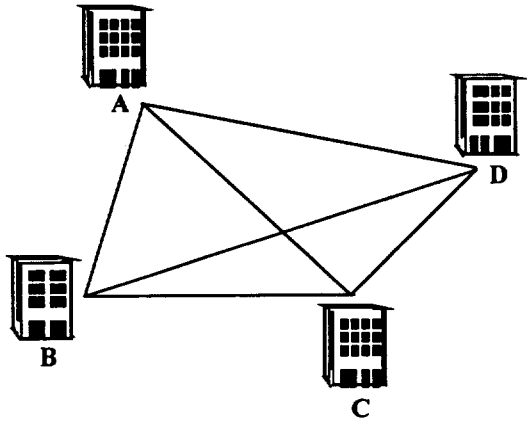
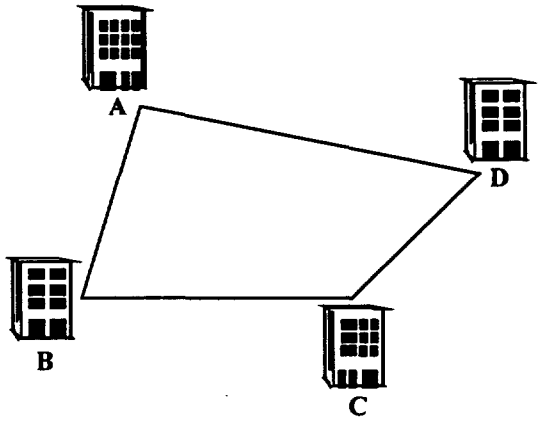


Diagram 3 - Step I



J. If there are more nodes to include, return to step E.

K. If the number of nodes exceeds the user specified maximum:

1. Divide the number of nodes by the maximum and round up to determine the number of rings that are needed.
2. Divide the number of nodes by the number of rings to equalize the rings.
3. Starting at the host, traverse the ring until the number of nodes determined in step 2 has been passed.
4. Replace the next segment with a new segment from the current node back to the host, and a segment from the host to the next node in the sequence.
5. If more than 2 rings, repeat steps 3 and 4 until all rings are built.

8.4.2.2 Sizing the Rings

After the rings are designed, the Model proceeds to determine the appropriate bandwidth required for each of the rings. This process begins by analyzing the number of switched access lines served by the ring. After determining special access circuit needs, it builds the proper number of DS1s and DS0s to accommodate the ring's traffic. A Ring Size Table then finds the capacity of the ring.

For each ring the Model performs the following calculations:

1. Calculate the total number of switched access lines served by the exchange.
2. Divide this number by the line to trunk (or tandem trunk) factor to determine the number of DS0 trunks required.
3. Divide this number by 24 to determine the number of DS1s required.
4. Multiply the number of switched access lines by the special access factor to determine the number of equivalent DS0 trunks required for special access circuits.
5. Divide this number by 24 to determine the number of DS1s required for special access.
6. Add the number of DS0s from steps B and D to get total DS0s.
7. Add the number of DS1s from steps C and E to get total DS1s.
8. Use the Ring Size Table on the control page to determine the minimum size of the ring required to serve these DS1s.
9. Use the Ring Size Table to find the total DS0 capacity of this ring.
10. Divide the total capacity by the required DS0s to determine the fill.

8.4.2.3 Costing the Rings

For each ring, the beginning and endpoints of each segment, the mileage between, the ring size (OC3, OC12 or OC48), and the fill factor are passed to the costing logic. If any of the segments are more than 45 miles, an appropriate number of repeaters is specified.

From the ring characteristics, the costing logic determines the investment required, converts total utilized investment of each type of transmission equipment into a cost per DS1, selects the appropriate mileage elements, and computes the cost per common transport minute.

The following provides additional detail about costing the rings.

For each ring, the beginning and endpoints of each segment, the mileage between, the ring size (OC3, OC12 or OC48), and the fill factor are passed to the costing logic. If any of the segments are more than 45 miles, an appropriate number of repeaters is specified.

The costing logic determines the investment required from the ring characteristics and converts total utilized investment of each type of transmission equipment into a cost per DS1. The appropriate termination equipment components are selected from the following list: Fiber Tip Cable, Fiber Patch Panel, Fiber Optic Terminal, DS3 Card, DS1 Card, OC3 Card, DSX3 Cross Connect, DSX1 Cross Connect Jack Field, Channel Bank, and Channel Bank Card. The following illustrates the termination equipment calculation:

[(Equipment Component Investment * Units Required) / DS1 Capacity] / Utilization Factor * (1+Power Factor) * Annual Charge Factor = Annual Cost Per DS1 by Equipment Component

Based on the ring characteristic, the following mileage equipment components are utilized, as appropriate, within the costing logic associated with the transit cost element: aerial fiber, underground fiber, buried fiber, pole lines and conduit.

The following illustrates the mileage equipment calculation:

[(Unit Investment Per Mile * Units Required) / Fiber Utilization Factor] / Terminal Utilization Factor * Annual Charge Factor = Annual Cost Per DS1 by Equipment Component Per Mile

Annual Cost per DS1 by Equipment Component Per Mile * Fiber Mix Ratio = Weighted Annual Cost Per Mile by Equipment Component

Sum all components by the ring size and the result is a weighted annual cost per mile.

The cost per common transport is developed by taking the dedicated DS1 transport cost results and dividing the single termination and transit cost elements by 216,000 minutes. 216,000 minutes of use per DS1 is equal to 9,000 minutes of use per DS0 times 24 voice-grade circuits per DS1.

8.4.3 Results

Results are provided for public switched network common transport on an individual ring basis, recognizing the use of existing LEC wire centers, mileage

characteristic, and each ring's specific utilization. The common transport results are utilized in the development of the universal service fund monthly transport cost per line by exchange.

SECTION 9.0

SIGNALING

9.1 Introduction

Signaling costs for use in developing per line investments for BCPM 3.1 are provided through a user input table which reflects the cost of building a modern SS7 network. The input table provides investments for Residence and Business lines for Small, Medium, and Large companies. The signaling cost for a wire center is based on a weighted average of residence and business lines associated with that wire center. Values in the input table are developed by running the BCPM Signaling Cost Proxy Module (SCPM)[48] for portions of the U S WEST territory.

Users have the option to either use the provided default values or input their own values. A Beta version of the SCPM is available at the BCPM web site for users who wish to develop signaling investment figures based on their own network configuration. A future release of BCPM will incorporate the SCPM module into BCPM.

In general, analysis from SCPM data runs indicates that signaling accounts for less than 1/2 of one percent of total per line investment.

9.2 BCPM 3.1 Enhancements

In previous releases of BCPM, a portion of the signaling cost was included in the switch investment. BCPM 3.1's approach for determining signaling costs differs substantially from the method used previously. Values in the BCPM Signaling Input Table are created by analyzing data produced from SCPM. SCPM:

- Creates a two tiered SS7 Signaling network using a combination of user definable inputs and LERG data;
- Uses the existing SS7 signaling network as the basis for the SCPM network;

[48] A detailed discussion of SCPM methodology is included in the November 1997 version of the Benchmark Cost Proxy Model Release 3.0 Model Methodology.

- Uses actual data to develop the octet, millisecond and data dip needs of the network as the foundation elements to determine signaling investment; and
- Takes the octet, millisecond and data dip needs of the network and calculates the proper number of packet switches, on line data bases and signaling links.

SECTION 10.0

SUPPORT PLANT

10.1 Introduction

Once the Model calculates the loop, switching, and interoffice plant (excluding land and building) needed for each Grid, user adjustable investment ratios are used to load in the support investments. Support investment represents those plant items not directly used in the provisioning of basic service.

10.2 Support Investment Methodology

BCPM 3.1 produces estimates of total investment less support investment in the loop module. Land and building investment estimates are generated in the switch module. The remaining investment estimates, i.e. support investments, are provided in the Report Module.

Support investment estimates are derived through the application of support factors, whose values are directly specified by the user. These factors represent the ratio of support investment in various accounts to total investment, less support, land, and building investment. BCPM 3.1 allows the user to specify support factors for three size classifications of companies: small, medium, and large.

The support accounts are as follows:

Network Support:
- 2112 Motor Vehicles
- 2114 Special Purpose Vehicles
- 2115 Garage Work Equipment
- 2116 Other Work Equipment
- Total Network Support = 2112 + 2114 + 2115 + 2116 + 2111 (Land)

General Support:
- 2122 Furniture
- 2123 Office Equipment

2124 General Purpose Computers
Total general Support = 2122 + 2123 + 2124 + 2121
(Buildings)

As an example, consider the default support ratios shown in the following Table . Assuming a total investment of $1 million, land investment of $100,000 and building investment of $250,000 yields the following estimated annual support investment (uncapped).

	Relevant Investment	Support Ratio	Support Investment
2112 Motor Vehicles	$ 1 million	1.34 %	$ 13,400
2114 Special Purpose Vehicles	$ 1 million	0.00 %	$ 0
2115 Garage Work Equipment	$ 1 million	0.04 %	$ 400
2116 Other Work Equipment	$ 1 million	0.93%	$9,300
2111 Land			$100,000
Total Network Support			$123,100
2122 Furniture	$ 1 million	0.30 %	$3,000
2123 Office Equipment	$ 1 million	0.78 %	$7,800
2124 General Purpose Computers	$ 1 million	2.15 %	$21,500
2121 Buildings			$250,000
Total General Support			$282,300

SECTION 11.0

CAPITAL COSTS

11.1 Introduction

The BCPM 3.1 Capital Cost Module develops a series of annual charge factors for Depreciation, Rate of Return and Tax Rates that when applied to individual investment categories developed in other modules, produce capital costs for use in developing Universal Service Fund costs.

11.2 Annual Cost Factors

To develop annual charge factors, BCPM 3.1 includes a powerful yet simple model that allows the user to vary the basic inputs to arrive at the Depreciation, Cost of Capital, and Tax Rates for each account. This account by account process was designed to recognize that all of the major accounts have differing economic lives, salvage values, cost of removal, tax lives, and survival curves, that ultimately lead to distinct capital costs. The module incorporates all of the methodologies that are currently in practice today, including: Deferred taxes, Mid-year, Beginning Year, and End Year placing conventions, Gompertz-Makeham Survival curves, Future Net Salvage Values, Equal Life Group methods, and many others. The module also incorporates separate Cost of Debt and Equity rates, along with the Debt to Equity ratio.

11.3 Applying Cost Factors to Investment Accounts

Once the annual charge factors are developed, they are multiplied by the investment developed in previous modules (account by account) to arrive at yearly capital costs. These yearly amounts are then converted to a monthly amount.

The Annual charge factor categories include:

Rate of Return,
Depreciation,
FIT,
State Taxes, and

Other Taxes.

11.4 User Adjustable Inputs

All of the variables included in the Capital Cost Module are user adjustable. The default values for lives, salvage, and cost of removal are based upon a LEC industry data survey requesting forward looking values. The curve shapes of the survival patterns are provided by the United States Telephone Association (USTA) capital recovery group.

A second set of inputs is provided to comply with the FCC's 10 criteria with respect to rate of return and economic lives.

SECTION 12.0

OPERATING EXPENSES

12.1 Introduction

The estimation of operating expense in BCPM 3.1 is the result of a straightforward application of user-adjustable expense factors. The user can specify values for every expense factor used by BCPM 3.1, whether in the form of expense per dollar of investment or expense per access line. For the most part, these factors are applied directly to investment estimated by the Model as simple multipliers.

12.2 Operating Expense Methodology

BCPM 3.1 allows the user to specify operating expenses as either a per access line amount or as a percent of investment. The Model is flexible so that the user can specify a subset of account operating expenses on a per-line basis with the remainder specified as a percent of investment, according to the user's preferences regarding the appropriate application methodology.

The expense accounts used by BCPM 3.1 are as follows:

Network Support:	6110 Total Network Support
General Support:	6120 Total General Support
CO Switching:	6212 Digital Electronic
CO Transmission:	6232 Circuit Equipment
Information Orig/Term:	6310 Total Information Orig/Term
Cable and Wire Facilities:	6411 Poles
	6421.1 Aerial Copper Cable
	6421.2 Aerial Fiber Cable
	6422.1 Underground Copper Cable
	6422.2 Underground Fiber Cable
	6423.1 Buried Copper Cable
	6423.2 Buried Fiber Cable

	6441 Conduit Systems
Plant Nonspecific Operations:	6510 Other Property, Plant and Equipment
	6530 Total Network Operations
Customer Operations:	6610 Total Marketing
	6620 Total Services
Corporate Operations:	6710 Total Executive and Planning
	6720 Total General and Administrative
Uncollectibles:	6790 Provision for Uncollectibles
Taxes:	7240 Other Operating Taxes

The application of the expense factors is straightforward. If a per-line expense factor is specified, then total operating cost for the relevant account is simply a function of the number of access lines. If a percent-of-investment factor is specified, then total operating expense is a function of investment, usually of that in the relevant account.

As with support factors, BCPM 3.1 allows the user to specify operating expense factors for three size classifications of companies: small, medium, and large. The Model also allows the user to differentiate between operating expenses pertinent to serving business customers and those relevant to serving residential customers.

SECTION 13

REPORT MODULE

13.1 Introduction

The Report Module provides the final step in the process of developing universal service support levels. In the module, cost factors, including depreciation, return and taxes, are combined with operating expenses to generate monthly costs. Monthly costs are then used to calculate universal service support for a given benchmark. These support levels are available at the grid, wire center, company, or state level.

13.2 Report Example

As an example, a state level summary would contain the following information:

Investment Per Line Data (including capped[49] and uncapped annual amounts)
(The following four categories are added to produce the Total Investment)

Loop Investment
+ Switch Investment
+ IOF Investment
+ Other Investment
Total Investment

Expenses Per Month Data (including capped and uncapped amounts)
(The following two categories are added to produce the Total Cost Per Line)

Total Capital Costs Per Line
+ Total Operating Expenses Per Line
Total Cost Per Line

[49] Grids with Average Loop Investment per line over $10,000 are capped at $10,000 as a default value when invoking the cap on loop investment. The user has the option to set a different cap value at a national level or by entering the cap at the wire center level in the FCC Lines file. The results of that value would be reported here in addition to the uncapped value.

Gross Receipts Tax[50]

Line Data

Average Loop Length in Feet
Lines Above $10K Loop Investment
Number of Households

(The following four categories are added to produce the Total GRID Lines Served)

Number of Residential Lines
+ Number of Single Business Lines
+ Multiple Business Lines
+ Non Switched Lines
Total GRID Lines Served

[50] Since Gross Receipts Tax rates vary substantially from state to state, they are not included in the monthly cost.

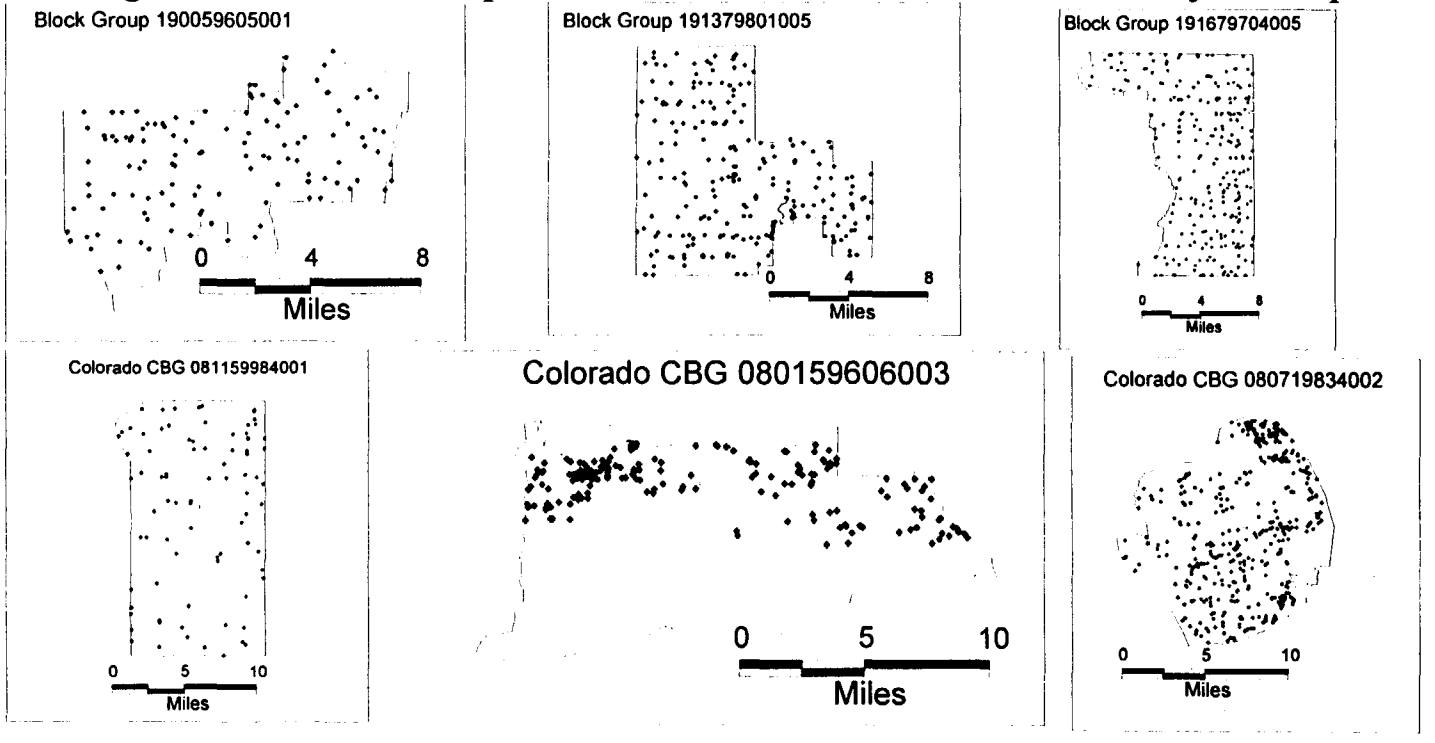
BCPM 3.0 Model Methodology

Appendix A

Appendix A Exhibit 1

BCPM Enhanced Customer Location

- Digitized Satellite Map Data for Random CBGs with Density < 5/sqmi



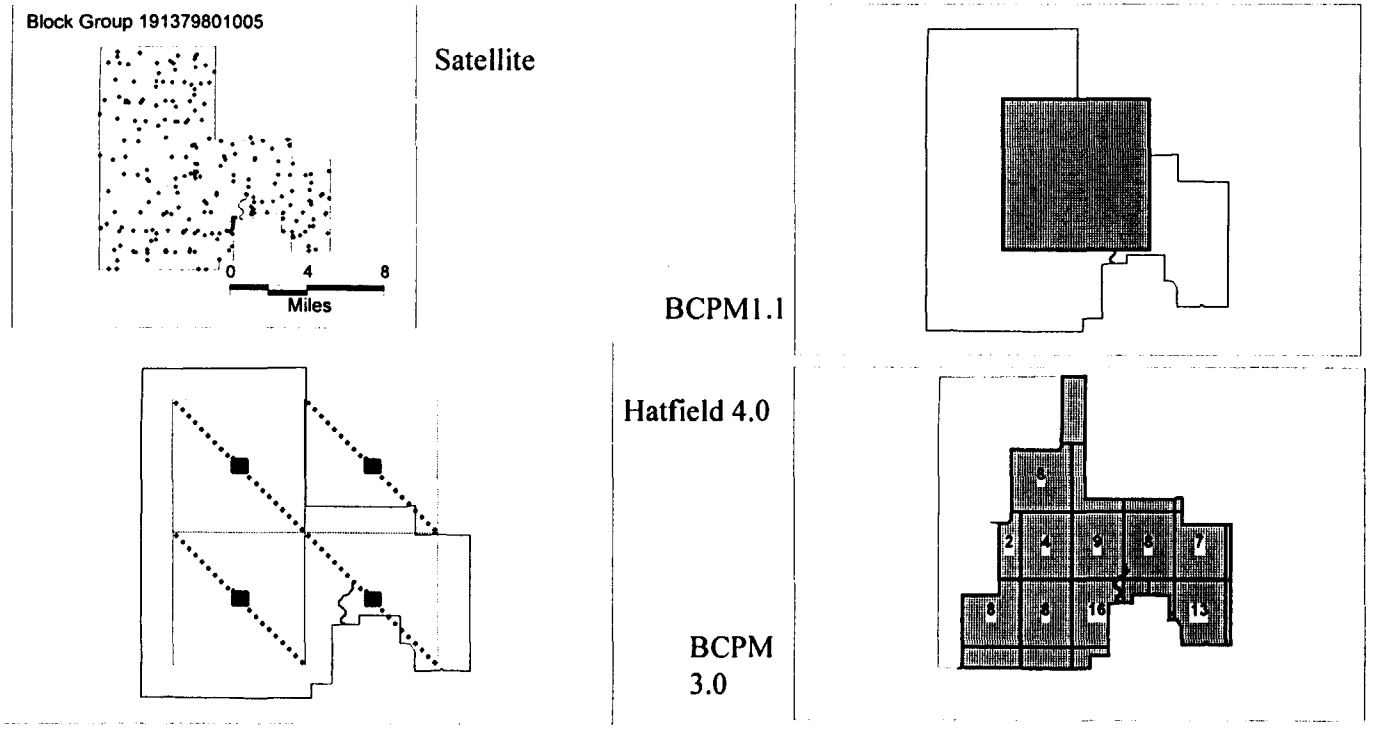
Developed by: Sprint. USWEST BELLSOUTH INDETEC International

Any representation of data is for illustrative purposes only.

Appendix A Exhibit 2

BCPM Enhanced Customer Location

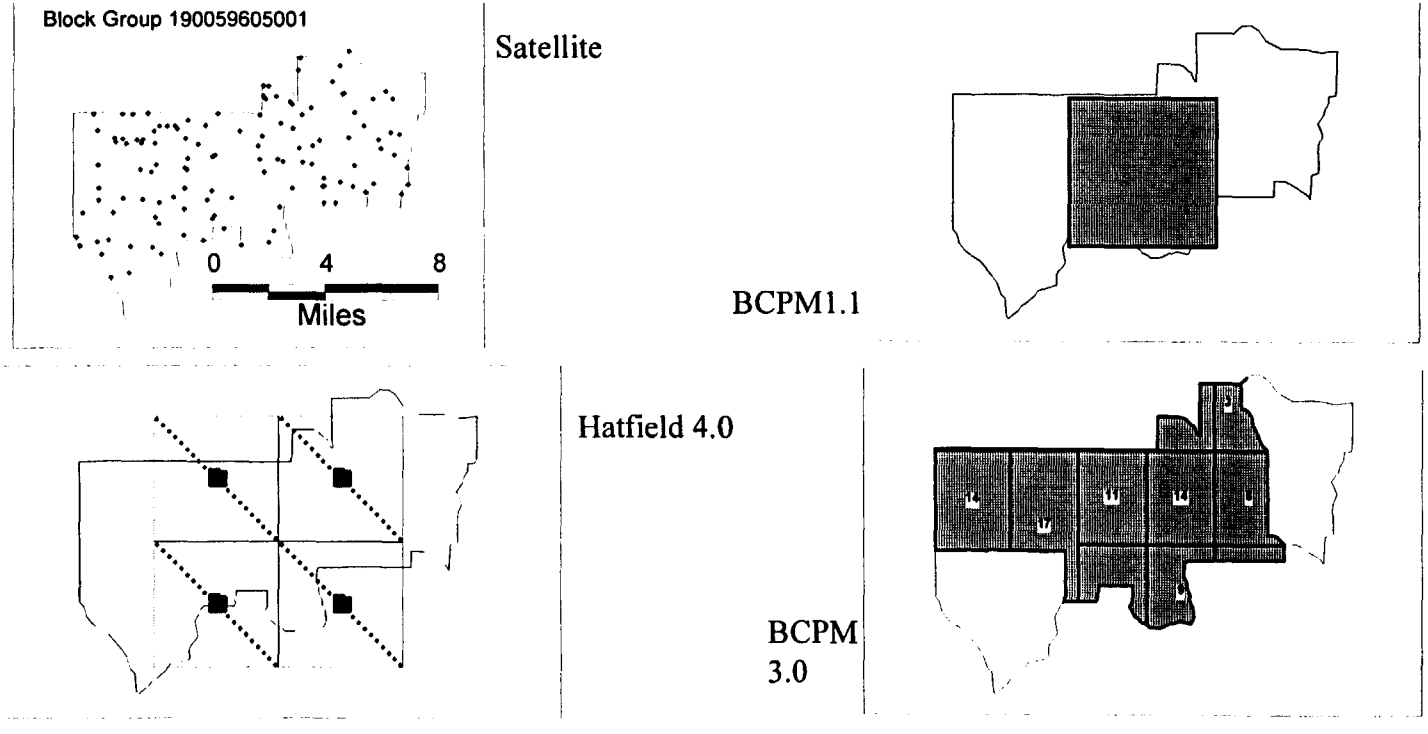
- Comparison of BCPM1.1, HM4.0, And BCPM 3.0



Appendix A Exhibit 3

BCPM Enhanced Customer Location

■ Comparison of BCPM1.1, HM4.0, And BCPM 3.0



Developed by: Sprint. US WEST BELLSOUTH INDETEC International

Any representation of data is for illustrative purposes only.

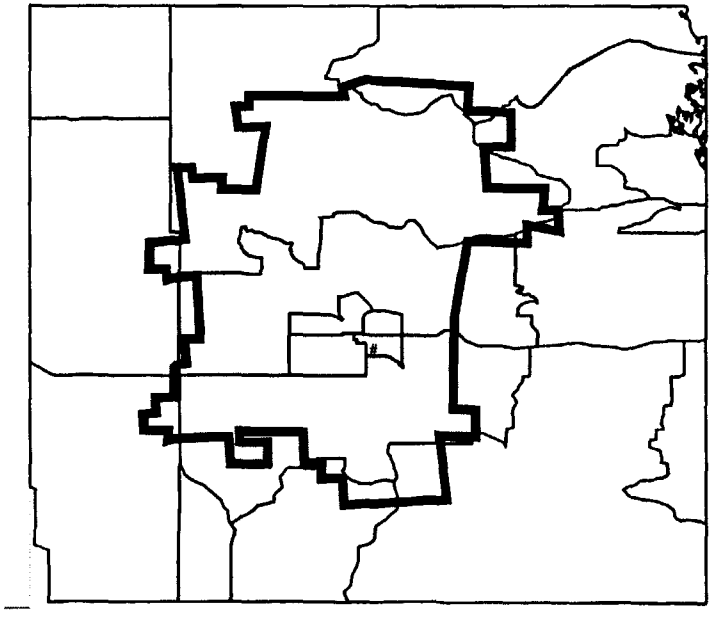
Appendix A Exhibit 4

BCPM Enhanced Customer Location

■ Improved Wire Centers

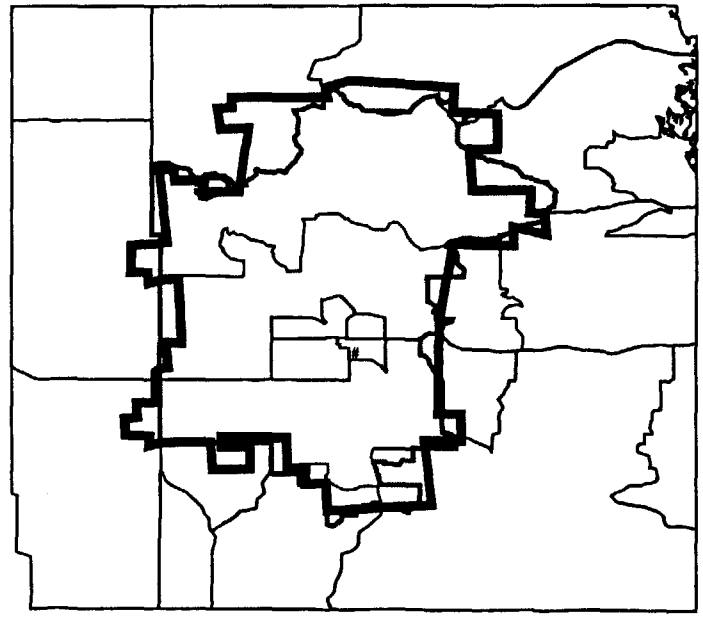
Actual Wire Center Boundary

Representative Hatfield / BCPM1.1 Boundary



Actual Wire Center Boundary

BLR Boundary used in BCPM 3.0



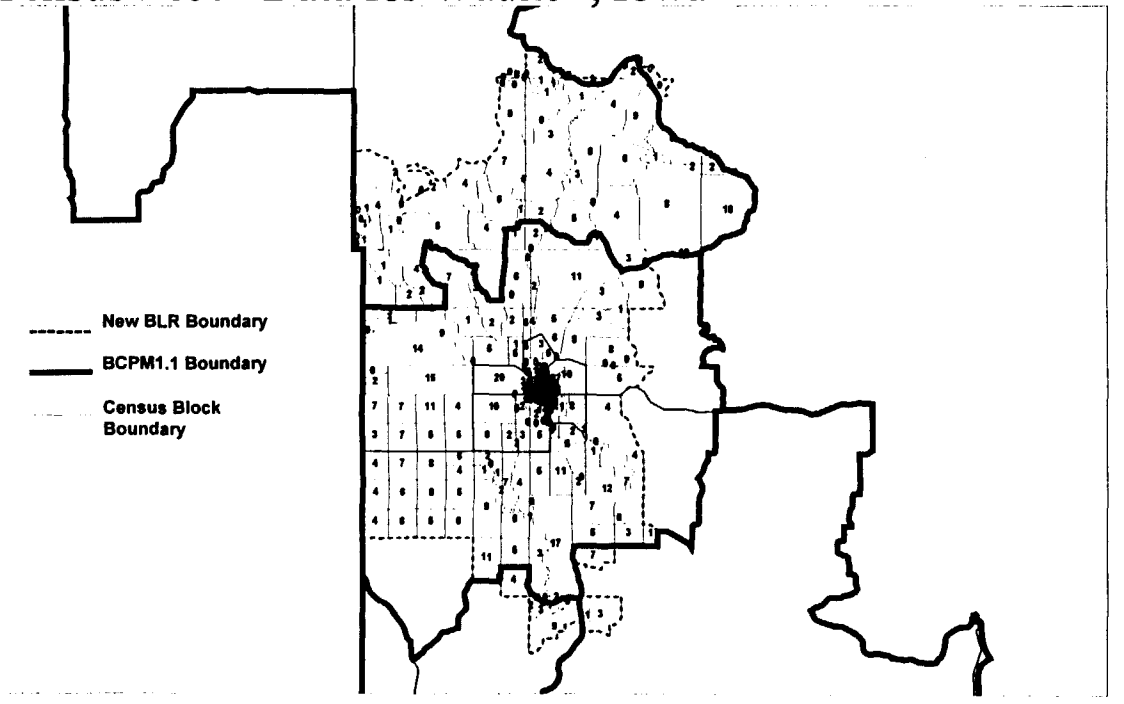
Developed by: Sprint. USWEST BELLSOUTH INDETEC International

Any representation of data is for illustrative purposes only.

Appendix A Exhibit 5

BCPM Enhanced Customer Location

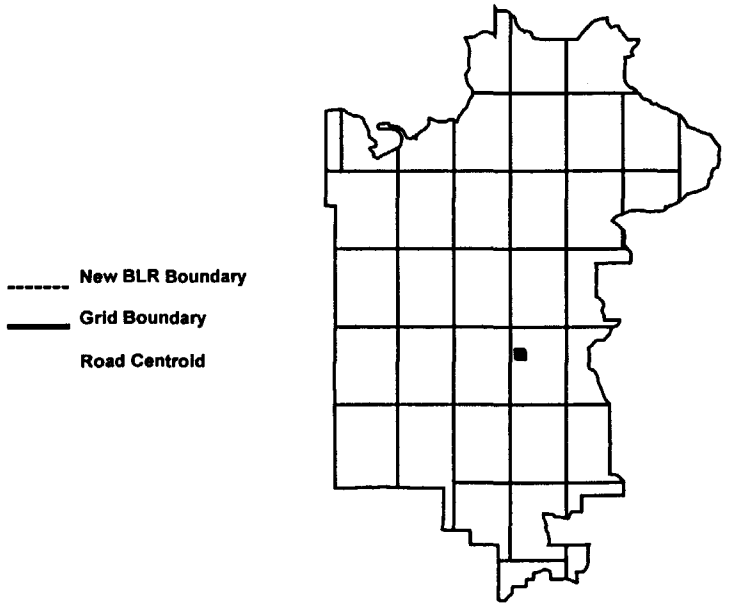
- Finer Level of Input Data
  - Census Block Data for Waukon, Iowa



Appendix A Exhibit 6

BCPM Enhanced Customer Location

- Variable Size Grids for Waukon, Iowa



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Any representation of data is for illustrative purposes only.

APPENDIX B

BCPM 3.1 DATA SPECIFICATIONS

The following summarizes the data to be provided for the BCPM 3.1 model. This data is provided as a set of comma-separated variable ASCII text files. For each of 50 states (in Alaska, for the Anchorage area only), the District of Columbia, and Puerto Rico, the following 4 files are produced:

- Base Grid File: Fundamental file, containing attributes and measures for each grid
- Wire Center Terrain File: Auxiliary file, containing terrain attributes of the service area
- Wire Center Information File: Cross reference for wire center as a whole
- CBG-to-Grid Equivalence: Cross reference for CBGs in a service area

Also, a single Telephone Companies' File relates each operating company to its parent company.

Each comma-separated variable file presents character fields without surrounding quotation marks. Spaces freely appear in such character fields, but commas and ampersands never do. When either a comma or ampersand appears in the original data, it is be converted to a space in that field in the output file.

Each comma-separated variable file includes, as its first record, the *Field Names* for the file. Those names appear in this paper, each in parentheses after the descriptive name of the field. The *File Names* also appear, each in parentheses after the file's title line in this paper. Each *ss* is the state abbreviation.

Grids and MicroGrids

The fundamental unit of measurement is the *grid cell*, measuring $1/25^{th}$ of a degree of latitude by $1/25^{th}$ of a degree of longitude, somewhat less than 15,000 feet on each side. The fundamental unit in building these grids is a *microgrid cell*, $1/8^{th}$ of a grid cell on each side (therefore $1/200^{th}$ of a degree on each side), 64 of these forming a full grid cell.

However, locations and clusterings of subscribers sometimes cause the reporting of information for an *effective grid cell* that is some part of a standard grid cell, or even parts of a standard grid cell augmented by a small part of another. Reporting is done per effective grid cell.

Base Grid File (*ssOUT.CSV*)

Each of the 50 state files contains one record per *effective grid cell*. The records appear in the following order, from major to minor, all fields in ascending sequence:

Wire Center CLLI Code
FDI Code

Each record of a state's Base Grid file contains the following fields, in the order presented here (names in parentheses are the column names in the file):

- **Wire Center Switch CLLI (*SWCLLI*)**: The 11-character code identifying the switch serving this grid cell. The switch and its location are taken from the LERG. The wire center service area is taken from the BLR *Wire Center Premium Package* data files. If more than one switch location serves a wire center service area, each microgrid cell is assigned to the *nearest* switch.

- **Central Latitude of Effective Grid Cell (*CentLat*)**: Latitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Central Longitude of Effective Grid Cell (*CentLng*)**: Longitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Area of the Effective Grid Cell (*AreaSqMi*)**: The area, presented as square miles with up to 6 fractional digits.

- **Depth To Bedrock in Inches (*RockDepL*)**: Minimum depth to bedrock for the effective grid cell, expressed in inches with up to 2 fractional digits. Terrain information is taken directly from *STATSGO* data. If an effective grid cell spans more than one terrain area as defined by STATSGO, the attributes of the areas are proportionally weighted ... This is done for the next five measures as well.

- **Rock Hardness (*RockHard*)**: Predominant rock hardness for the effective grid cell ... HARD or SOFT, or blank to indicate neither.

- **Surface Soil Texture (*SurfTex*)**: Predominant surface soil texture in the effective grid cell, an abbreviation of up to 7 characters.

- **Water Table Depth in Feet (*WTDepL*)**: Minimum water table depth for the effective grid cell, expressed in feet with up to 2 fractional digits.

- **Minimum Soil Slope (*SlopeL*)**: Minimum soil slope for the effective grid cell, expressed with 2 fractional digits.

- **Maximum Soil Slope (*SlopeH*)**: Maximum soil slope for the effective grid cell, expressed with 2 fractional digits

- **Number of Business Lines (*BusLines*)**: Count of Business Lines in the effective grid cell. This number is allocated from PNR Business Lines/Firms data, provided principally at the Census Block Level. Where PNR's data was *not* assigned to the Census Block level (about 15% of those records), we have first *allocated* it to the Census Block level, allocating the higher-level lines and firms to Census Blocks that already have business lines, on a basis proportional to the number each constituent Census block already has. This number, for the

effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell , in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

- **Number of Business Firms (*BusFirms*)**: Count of Business *Firms* from the same source, allocated and apportioned as above.

- **Number of Households (*HHlds*)**: Count of Households in the effective grid cell. The source for this number is the Census Bureau's 1990 figures per Census Block; these numbers are then modified for each Census Block of a county by the Census Bureau's 1995 estimate of population change in that county. This number, for the effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell, in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

- **Number of Housing Units (*HUnits*)**: Count of Housing Units in the effective grid cell. The source for this number is the Census Bureau's 1990 figures per Census Block; these numbers are then modified for each Census Block of a county by the Census Bureau's 1995 estimate of population change in that county. This number, for the effective grid cell, is apportioned from the numbers for Census Blocks overlapped by this effective grid cell , in general, on a relative area basis ... but for Census Blocks larger than 1/4 square mile, it is apportioned on a relative road segment length basis.

The following ten fields are subdivision of the above Number of Housing Units, indicating the number of housing units in each of several structure sizes and types; with some tolerance for rounding, these 10 numbers – including their fractional digits – should sum to the Number of Housing Units above. The 10 fields are:

- **Number of Housing Units in Single-Unit Detached Structures (*HU1Det*)**: Units in the traditional standalone house.
- **Number of Housing Units in Single-Unit Attached Structures (*HU1Att*)**: Units that are, for example, garage apartments.
- **Number of Housing Units in Two-Unit Structures (*HU2*)**: Units in a duplex.
- **Number of Housing Units in 3- to 4-Unit Structures (*HU3to4*)**: Units in typical smallest apartment buildings or triplex or quadruplex.
- **Number of Housing Units in 5- to 9-Unit Structures (*HU5to9*)**: Units in typical modest sized apartment buildings.
- **Number of Housing Units in 10- to 19-Unit Structures (*HU10to19*)**: Units in larger apartment buildings.
- **Number of Housing Units in 20- to 49-Unit Structures (*HU20to49*)**: Units in large apartment buildings.
- **Number of Housing Units in 50-or-Greater-Unit Structures (*HU50Plus*)**: Units in very large apartment buildings, typically high-rise.
- **Number of Housing Units that are Mobile Homes (*HUMbl*)**: Mobile home units.
- **Number of Housing Units that are None of the Above (*HUOther*)**: For example, houseboats.

The record continues with the remaining fields:

- **Latitude of Road Centroid (*RdCentLat*)**: For that center point of road segments of this effective grid cell, this is the latitude (the "Y" value).

- **Longitude of Road Centroid (*RdCentLng*)**: For each effective grid cell, a center point of road segments is calculated. This is the longitude (the "X" value) of that center point.

- **Distance from Switch (*SWDist*)**: Straight-line distance, in feet, of the road centroid of this effective grid cell from the switch that serves this effective grid cell.

- **FDI Code (*FDICode*)**: This 7-character code indicates the path and sequence of the feeder, subfeeder, and any part 2 subfeeder used to reach the road centroid of this effective grid cell. The characters of this code are in the form *qbyydzz* where:

  - *q* indicates the quadrant: 1=East, 2=North, 3=West, 4=South
  - *b* indicates any main feeder splitting: 0=No split, 1=North/East leg, 2=South/West leg
  - *yy* indicates a relative number (01..99) of this subfeeder, in this direction, off its main feeder
  - *d* indicates direction of subfeeder from feeder: 1=East, 2=North, 3=West, 4=South
  - *zz* indicates a relative number (01..99) of this part 2 subfeeder, off this subfeeder ... If no part 2 subfeeder, this code is 00

  In addition, where any main feeder *splits*, a "dummy record" appears with Switch CLLI Code, with an FDI Code of ***q*099999**, with a Main Feeder Length of **10000**, with terrain values, and with all other fields zero.

- **Length Along Main Feeder (*MainFdrLen*)**: Distance, in feet, along main feeder from switch to the point at which this effective grid cell's subfeeder comes off the main feeder.

- **Length Along Subfeeder (*SubFdrLen*)**: Distance, in feet, along subfeeder from point at which this effective grid cell's subfeeder leaves main feeder to:

  - If a part 2 subfeeder is used, to the point at which the part 2 subfeeder departs from this subfeeder
  - If *no* part 2 subfeeder is used (e.g., inside 10,000 feet), to the road centroid of the effective grid cell itself

- **Length Along Part 2 Subfeeder (*Pt2FdrLen*)**: If a part 2 subfeeder is used, distance in feet from point at which part 2 subfeeder departs subfeeder to the road centroid of this effective grid cell ... If no part 2 subfeeder is used, this number is 0.

Each effective grid cell is further partitioned into four *reporting quadrants*, unless the effective grid cell is only the size of a microgrid cell:

- Upper Left Quadrant (UL)
- Upper Right Quadrant (UR)
- Lower Left Quadrant (LL)
- Lower Right Quadrant (LR)

Each effective grid cell record includes information of all four of these quadrants, in the order specified above. For each of the quadrants, the following information appears, unless the effective grid cell is a *microgrid* cell (1/200th by 1/200th), in which case the full set of numbers is presented as the first (UL) quadrant's data, and the numbers for the remaining quadrants are all zero:

- **Quadrant Number of Housing Units (*UL/UR/LL/LRHUnits*)**
- **Quadrant Number of Households (*UL/UR/LL/LRHHlds*)**
- **Quadrant Number of Business Lines (*UL/UR/LL/LRBusLines*)**
- **Quadrant Road Segment Length (*UL/UR/LL/LRRdSegLen*):** In feet
- **Quadrant Road Reduced Area (*UL/UR/LL/LRRdArea*)**
- **Quadrant Road Centroid Horizontal (X) Distance (*UL/UR/LL/LRRdCHDist*)**: From grid cell road centroid, in feet
- **Quadrant Road Centroid Vertical (Y) Distance (*UL/UR/LL/LRRdCVDist*)**: From grid cell road centroid, in feet

Wire Center Terrain File (*ssWCTRN.CSV*)

There is one record per wire center, in ascending order by wire center switch 11-character CLLI code. The data fields are these:

- **Wire Center Switch CLLI *(SWClli)***: The 11-character code identifying the switch that serves the wire center area.

- **Area of the Service Area *(Area_WC)***: The area, in square miles with fractional digits, of the wire center service area.

- **Depth To Bedrock (Inches) *(Bedrock_Depth_WC)***: Minimum depth to bedrock for the wire center service area, expressed in inches with up to 2 fractional digits.

- **Fraction of Area with HARD Rock *(Rock_Hard_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is HARD.

- **Fraction of Area with Normal Rock *(Rock_Norm_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is normal.

- **Fraction of Area with SOFT Rock *(Rock_Soft_Fr)***: Decimal fraction, 4 fractional digits, indicating portion of wire center service area for which rock hardness is SOFT.

- **Surface Soil Texture** ***(Soil_Type_WC)***: Predominant surface soil texture in the wire center service area, an abbreviation of up to 7 characters.

- **Water Table Depth (Feet)** ***(Water_Depth_WC)***: Minimum water table depth for the wire center service area, expressed in feet with up to 2 fractional digits.

- **Minimum Soil Slope** ***(Slope_Min_WC)***: Minimum soil slope for the wire center service area, expressed as degrees with 2 fractional digits.

- **Maximum Soil Slope** ***(Slope_Max_WC)***: Maximum soil slope for the wire center service area, expressed as degrees with 2 fractional digits.

Wire Center Information File *(ssWCINFO.CSV)*

There is one record per wire center, in ascending order by wire center switch 11-character CLLI code. The data fields are these:

- **Wire Center Switch CLLI** ***(SWClli)***: The 11-character code identifying the wire center and its service area.

- **Operating Company Number** ***(OCN)***: Number of the operating company

- **Operating Company Name** ***(Oper_Company)***: Name of the operating company

- **Central Office Type** ***(Switch_Type)***: Type of the central office (H=Host, R=Remote)

CBG-to-Grid Equivalence File *(ssAGGBG.CSV)*

There is one record per combination of Census Block Group and effective grid cell that overlays any part of it. These records are in the following order, major to minor, all ascending:

Switch CLLI Code
FDI Code
Census Block Group FIPS Code

Each record contains the following data fields:

- **Switch CLLI Code** ***(SWCLLI)***: 11-character CLLI code identifying the wire center to which this record belongs.

- **Central Latitude of Effective Grid Cell** ***(CentLat)***: Latitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **Central Longitude of Effective Grid Cell *(CentLong)***: Longitude of the nominally central point of the effective grid cell, presented as degrees with 4 fractional digits.

- **FDI Code *(FDICode)***: FDI Code for the effective grid cell.

- **Census Block Group FIPS Code *(CBG_FIPS)***: Standard code identifying a CBG.

- **Number of Business Lines (*BusLines*)**: Count of Business Lines in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Business Firms (*BusFirms*)**: Count of Business *Firms* in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Households (*HHlds*)**: Count of Households in the effective grid cell that were allocated from the specified Census Block Group.

- **Number of Housing Units (*HUnits*)**: Count of Housing Units in the effective grid cell that were allocated from the specified Census Block Group.

Telephone Companies' File *(TELCOS.CSV)*

This file is a single file for the entire country. It is in order by Operating Company Name, ascending. The data fields are:

- **Operating Company Number *(OCN)***: "OCN"

- **Operating Company Name *(Oper_Company)***: Name as it appears in Wire Center Information file.

- **Parent Company Name *(Parent_Company)***: Name of its parent company.

- **Company Size *(Parent_Size)***: (S=Small, M=Medium, L=Large)

APPENDIX B

BCPM 3.1 PROCESSING STEPS

This paper describes the steps in processing BCPM 3.1 data. Processing occurs state-by-state.

Step 1: Create Appropriate Wire Center Service Areas Table

Program: MapBasic **B2WCSA**
Tables/Files Used: ***CDDrive:\\aa\aa*WCSA**, BLR wire center boundaries
Tables/Files Produced: ***basepath*\aa\aa*WCSA,*** Effective BLR wire center boundaries

This program selects wire center boundaries for which the central office is *within* the state. It sorts them into CLLI-8 ascending order and writes the resulting table to the base directory.

Step 2: Determine Counties Covered by Wire Centers of a State

Program: MapBasic **B2WCCNTY**
Tables/Files Used: ***basepath*\aa\aa*WCSA**, wire center boundaries
***basepath*\USCNTYHR**, high resolution county boundaries
Tables/Files Produced: ***basepath*\aa\aa*WCCOS.TXT**, ASCII text list of counties required

This program determines the counties covered by a state's wire centers. These will typically be all counties of the subject state, but can also be several counties from one or more adjacent states.

The program considers a county should to be included if at least 2% of that county's area is intersected by the set of wire center boundaries for the state.

The resulting ASCII text file is produced in ascending state/county FIPS code sequence.

Step 3: Determine the Switches for the Wire Center Service Areas

Program: MapBasic **B2WCSWS**
Tables/Files Used: ***basepath*\aa\aa*WCSA,*** wire center service area boundaries
***basepath*\LERG7U**, all unique switches defined in LERG
Tables/Files Produced: ***basepath*\aa\aa*WCSWS**, switches for state wire centers

This program determines the switches that qualify. There may be more than one per wire center boundary. But there *must* be at least one per wire center boundary ... if there is not, the program issues an error message.

Invariably, some exceptions, indicated by one or more messages in the message box, must be dealt with manually. This *could* require a further reordering of the ***aa*WCSWS** table, which must be in WCCLLI/SWCLLI name order.

Step 4: Generate 1/200th Degree Grid Cells for Each Wire Center Service Area

Program: MapBasic **B2WCGRID**
Tables/Files Used: ***basepath**aa**aa*WCSA**, wire center boundaries
***basepath**aa**aa*WCSWS**, wire center switches
Tables/Files Produced: ***basepath**aa**aa*WCGR**, grid cells for all wire centers of the state
***basepath**aa*\B2LOG**, ASCII text log file of errors encountered

The ***aa*WCGR** table consists of 1/200th degree grid cells as MapInfo regions, each of which is (if necessary) cut to precisely fit within wire center boundaries ... thus not all of these regions are true "square" grids.

Each record of this table contains the CLLI code of its wire center, and the latitude and longitude of the numerical centerpoint of the grid cell that is represented by the record.

Mutually distinct parts of the same 1/200th degree grid may appear in different (adjacent) wire centers.

The resultant records are in order by wire center CLLI / switch CLLI (whatever the order of the input ***aa*WCSWS** table), and within a wire center / switch area, by ascending latitude (major) and ascending longitude (minor).

If MapInfo has an error when cutting the grid cells, a log – **B2aaLOG** – is produced indicating the errors, and the program corrects / fixes those errors.

Step 5: Assign the Minimum Bounding Rectangle for Each Switch's Area

Program: MapBasic **B2SWMBR**
Tables/Files Used: ***basepath**aa**aa*WCGR,** wire center grid cells
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers

This program determines, from the assigned grid cells, the minimum bounding rectangle (MBR) for the area covered by each of the switches, and updates the switches file with those 4 values.

Step 6: Fully Format the Grid Cell Records

Program: MapBasic **B2FMWCGR**
Tables/Files Used/Affected: ***basepath\aa\aa*WCGR**, grid cells for wire centers

This program just adds all additional columns in the ***aa*WCGR** table required for succeeding processes.

Step 7: Set the Record Number in the *aa*WCGR Records

Program: DOS C-Program **B2RCDNBR**
Tables/Files Used/Affected: ***basepath\aa\aa*WCGR**, wirecenter grids

The two parameters to this program are *StateAbbr* and *BasePath*. The program updates the records in place.

Step 8: Collect the Terrain Data for All States Served by This State's Wire Centers

Program: MapBasic **B2BGTRN**
Tables/Files Used: ***CDdrive:*\CBGSOILS*aa*BGSOILS**, Terrain Data by Block Group
Tables/Files Produced: ***basepath\aa\aa*WCSOIL**, terrain data for all block groups served

This program uses the Stopwatch Maps *State Terrain Data by Census Block Group* product as its source. It copies to a table on hard disk the terrain data for all block groups of all states served by this state's wire centers. That table is used in the next step.

Step 9: Determine Area Overlap of Terrain Data

Program: MapBasic **B2GRTRN**
Tables/Files Used: ***basepath\aa\aa*WCSOIL**, terrain data for all block groups served
Tables/Files Used/Affected: **C:\TEMP\GRBGX**, a temporary table

This program joins information in these two tables, writing it to a temporary table on the local drive **C:\TEMP\GRBGX**. It then ends, often with an *Error Overlaying Objects*.

Step 10: Assign Terrain Data to Each Grid Cell

Program: DOS C-Program **B2GRBG2**
Tables/Files Used: **C:\TEMP\GRBGX**, a temporary table

Tables/Files Used/Affected: ***basepath\aa\aa*WCGR**, wire center grid cells

This program actually performs the assignment to the grid cells. Run it from the base directory, with two arguments: *StateAbbr* and *BasePath.*

Step 11: Collect the Census Block Boundaries for the State's Wire Centers

Program: MapBasic **B2ALLCBS**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of counties required
CDdrive:**CBBY**aa**CBssccc, Census Block Boundary tables on CD
***basepath**aa**aa*WCSA**, wire center service areas
Tables/Files Produced: ***basepath**aa**aa*WCCBS**, Census Block Boundaries for all these WCs

This program uses the list of counties required to direct the operator to mount the one or more CD-ROMs containing the Census Block boundaries for the required counties (some of which may be outside the subject state). It produces a table of all Census Block boundaries within the purview of the subject state's wire centers.

Step 12: Collect the Census Block-Level Housing Data

Program: DOS Batch File **B2CBDEMS.BAT**
DOS C-Program **C:\UTIL\CSVTOTAB.EXE**, plus other utilities
Tables/Files Used: ***basepath*\BXDEMS.DEF**, ASCII text file definition
CDdrive:*\XBLK\BX*ssccc, STF1B extract files
Tables/Files Produced: ***basepath**aa**aa*CBDEMS**, Census Block housing demographics

This batch file, file conversion utility program, and assorted other utility programs generate a table containing, for each occupied Census Block in any county (of any state) touched by one of this state's wire centers, the base housing demographics, including a 3-way distribution of housing units by structure size. ~~At~~ this point, this is unadjusted 1990 Census data.

Step 13: Collect the Block Group-Level Units-in-Structure Distribution Data

Program: MapBasic **B2BGHUS**
Tables/Files Used: ***CDdrive:*\BLOCK\REP*aa*G01**, Claritas BG Units in Structure by State
Tables/Files Produced: ***basepath**aa**aa*BGHUS**, resulting table for all BGs touched by WCs

This program copies the BG-level units-in-structure data, for Block Groups in all states touched by this state's wire centers, to a table, in FIPS order.

Step 14: Apply All Housing Unit Demographics to Census Block Table

Program: MapBasic **B2UPCBHU**

Tables/Files Used: ***basepath**aa**aa*CBDEMS**, Census Block housing demographics
***basepath**aa**aa*BGHUS**, BG units-in-structure
***basepath*\\POPADJ.TXT**, 1995 census adjustment factors by county
Tables/Files Affected: ***basepath**aa**aa*CBS**, Census Blocks table

This program applies the housing unit information from the above tables and file to the Census Blocks.

Step 15: Apply Business Lines/Firms Data to Census Block Table

Program: MapBasic **B2UPCBBU**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
***basepath**ss**ss*PNRCB**, CB-level businesses for all states touched
***basepath**ss**ss*PNRBG**, BG-level businesses for all states touched
***basepath**ss**ss*PNRTR**, TR-level businesses for all states touched
Tables/Files Used/Affected: ***basepath**aa**aa*CBS**, Census Blocks table

This program first collects PNR data for all counties touched into work files **C:\TEMP\PNRCB, C:\TEMP\PNRBG,** and **C:\TEMP\PNRTR**, sorted to FIPS order. It then applies that data to the Census Blocks file.

Step 16: Collect the Roads for a State's Wire Centers as MID/MIF Files

Program: DOS Batch File **B2TGRMIF**
DOS C-Program **B2TGRRDS.EXE**, plus other utilities
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
CDdrive:*\TIGER94*x**ss*\CB*ssccc.xxx, TIGER94 files
Tables/Files Produced: ***basepath**aa**aa*STS*ssccc*.MID/MIF**, importable files per county

This process creates, from TIGER94 CDs, the roads for all counties (in all states) touched by this state's wire centers.

Step 17: Import Roads MID/MIF Files to a MapInfo Table

Program: MapBasic **B2ALLRDS**
Tables/Files Used: ***basepath**aa**aa*WCCOS.TXT**, ASCII text list of all counties touched
***basepath**aa**aa*STS*ssccc*.MID/MIF**, importable files per county
Tables/Files Produced: ***basepath**aa**aa*RDS**, Census Blocks table

This program imports and collects all the above files into a single MapInfo table. When you are satisfied that the process is successful, you may erase the MID/MIF files, and the temporary ***aa*RD0** table.

Step 18: Relate Roads and Census Blocks

Program: DOS C-Program **B2CBRDS**
Tables/Files Used/Affected: ***basepath**aa**aa*RDS**, roads for the entire state
***basepath**aa**aa*CBS**, Census Blocks table

This DOS program (whose two parameters are *StateAbbr* and *BasePath*) determines and posts the total road segment lengths for each Census Block, and tags the Roads records with the WCCLLI code of the Census Block and the indication as to whether the CB is large, small, or empty.

Step 19: Create the Valid Roads Table and the Roads-In-Large-Census-Blocks Table

Program: MapBasic **B2SPLRDS**
Tables/Files Used: ***basepath**aa**aa*RDS**, roads for the entire state
***basepath**aa**aa*CBS**, Census Blocks table
Tables/Files Produced: ***basepath**aa**aa*VLDRDS**, valid roads for state
***basepath**aa**aa*LCBRDS**, roads for state in large Census Blocks

This program creates the two working Roads tables from the original.

Step 20: Determine Area Overlap of Smaller Census Blocks with Grid Cells

Program: MapBasic **B2SCBXGR**
Tables/Files Used: ***basepath**aa**aa*CBS**, Census Blocks table
***basepath**aa**aa*WCGR**, wire center grid cells
Tables/File Produced: ***basepath**aa**aa*SCBxGR**, small Census Block/microgrid join

This program determines the area overlap between microgrid cells and Census Blocks less than 0.25 square miles in size. This relationship will be used in the next step to allocate demographics from those Census Blocks to the overlaid grid cells.

If MapInfo stops this program with an *Error overlaying the objects*, you should save the SCBXGR temporary table as ***basepath**aa**aa*SCBxGR** and end the program.

Step 21: Allocate Demographic Data from Small Census Blocks to Microgrids

Program: DOS C-Program **B2ALLOSM.EXE**
Tables/Files Used: ***basepath**aa**aa*SCBxGR**, small Census Block/microgrid join
***basepath**aa**aa*CBS**, Census Blocks
Tables/Files Affected: ***basepath**aa**aa*WCGR**, wire center grid cells

This program uses the relationships determined above to add area-proportional Census Blocks demographics to the overlaid grid cells.

Step 22: Determine Road Segment Overlap of Larger Census Blocks with Grid Cells

Program: MapBasic **B2LCBXGR**
Tables/Files Used: ***basepath\aa\aa*LCBRDS**, large Census Block road segments
***basepath\aa\aa*WCGR**, wire center grid cells
Tables/File Produced: ***basepath\aa\aa*LCBxGR**, large Census Block road/microgrid join

This program determines the area overlap between microgrid cells and road segments of Census Blocks larger than 0.25 square miles in size. This relationship will be used in the next step to allocate demographics from those Census Blocks to the overlaid grid cells.

If MapInfo stops this program with an *Error overlaying the objects*, you should save the LCBXGR temporary table as ***basepath\aa\aa*LCBxGR** and end the program.

Step 23: Allocate Demographic Data from Large Census Blocks to Microgrids

Program: DOS C-Program **B2ALLOLG.EXE**
Tables/Files Used: ***basepath\aa\aa*LCBxGR**, small Census Block/microgrid join
***basepath\aa\aa*CBS**, Census Blocks
Tables/Files Affected: ***basepath\aa\aa*WCGR**, wire center grid cells

This program uses the relationships determined above to add road-length-proportional Census Blocks demographics to the overlaid grid cells.

Step 24: Calculate Road Information for Micro-grids

Program: MapBasic **B2RDNFO**
Tables/Files Used/Affected: ***basepath\aa\aa*VLDRDS**, Valid Roads table
***basepath\aa\aa*WCGR**, wire center grid cells
Tables Produced: ***basepath\aa\aa*GRxRD**, grid/road table

This program calculates the road centroid, total length of intersecting roads, and the road area for each Micro-grid.

Step 25: Aggregate Micro-grids

Program: DOS C-Program **B2WCAGG**
Tables/Files Used/Affected: ***basepath\aa\aa*WCSWS**, switches for state wire centers
***basepath\aa\aa*WCGR**, wire center grid cells
Tables/Files Produced: ***basepath\aa\aa*AGG**, aggregate grids

---

This program aggregates the Micro-grids based on the algorithm described in the BCPM2 Model documentation. For each group of aggregated Micro-grids, a record with a Wire-Center-unique aggregate grid ID and the aggregated values are output to the *aa*AGG table. Additionally, each Micro-grid is tagged with the aggregate grid ID.

Step 26: Calculate Feeder Information for Aggregate Grids

Program: DOS C-Program **B2WCFDR**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers
***basepath**aa**aa*AGG**, aggregate grids
Tables/Files Produced: ***basepath**aa**aa*FNFO**, feeder information

This program calculates the feeder lengths and FDI code for each aggregate grid. The table *aa*FNFO contains main feeder-angle information for each wire center that is necessary for creating MapInfo maps for the feeders.

Step 27: Calculate (and Replace With where Appropriate) Alternate Feeder Routes

Program: DOS C-Program **B2WCFD2**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches for state wire centers
***basepath**aa**aa*AGG**, aggregate grids
***basepath**aa**aa*FNFO**, feeder information

This program calculates the feeder lengths on an unsplit cardinal direction basis and, if this alternate feeder routing is shorter than the previous, substitutes it in the ***aa*FNFO** table.

Step 28: Generate the Primary Output CSV File

Program: MapBasic **B2OUTCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*AGG**, aggregate grids
Tables/Files Produced: ***basepath**aa**aa*OUT.CSV**, primary comma-separated variables file
***basepath**aa**aa*OUTZ.CSV**, empty records of the above file

This program sorts the AGG table into FDI Code within Switch CLLI. It generates the CSV file, creating where necessary a special record to reflect the split of a main feeder at 10,000 feet.

Step 29: Generate the Wire Center Terrain Information

Program: DOS C-Program **B2WCTRN**
Tables/Files Used/Affected: ***basepath**aa**aa*WCGR**, micro-grids
Tables/Files Produced: ***basepath**aa**aa*WCTRN**, summarized terrain table

---

This program summarizes the terrain data from the microgrids of a WC service area. Its two command-line arguments are *StateAbbr* and *BasePath*.

Step 30: Generate the Wire Center Terrain Output CSV

Program: MapBasic **B2TRNCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*WCTRN**, summarized terrain table
Tables/Files Produced: ***basepath**aa**aa*WCTRN.CSV**, comma-separated variables file

This program generates the record for each switch, in switch CLLI order, summarizing the terrain characteristics of the service area.

Step 31: Generate the Wire Center Info CSV File

Program: MapBasic **B2INFCSV**
Tables/Files Used/Affected: ***basepath**aa**aa*WCSWS**, switches in wire centers
***basepath*\TELCOS**, all telephone companies' file
Tables/Files Produced: ***basepath**aa**aa*WCINF.CSV**, comma-separated variables file

This program generates the record for each switch, in switch CLLI order, summarizing the ownership characteristics of the service area.

Postlude:

We ZIP the two files ***aa*OUT.CSV** and ***aa*OUTZ.CSV** into ***aa*OUT.ZIP**. We ZIP the two files ***aa*WCTRN.CSV** and ***aa*WCINF.CSV** into ***aa*WC.ZIP**. We then FTP these to the INDETEC FTP site.